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ABSTRACT

Two studies of meaningful learning in the utilization of educational film examined the effects of context, retrieval clues, and sequencing, using 39 students at a state university as subjects. Superordinate context statements in the form of verbal messages were inserted as advance organizers in experimental treatment versions of a film on pressure fields and fluid acceleration. Using a 2x2 factorial design for context-retrieval and sequencing variables, Experiment I measured one-day retention and Experiment II measured [illegible]-day retention. Findings indicated no significant main effects or interaction effects between the variables; however, it is suggested that the high degree of film content difficulty and unfamiliarity may have weakened possible positive effects of the advance organizers. Ten references are included. (Author/BK)

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Effects of Context, Retrieval Cues and Sequencing on Learning and Retention of Fact from Film

Faculty Research Grant 312

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Abstract

In this investigation of meaningful learning in the utilization of educational film, the effects of context, retrieval cues, and sequencing were studied. Superordinate context statements in the form of verbal messages were inserted as advance organizers in experimental treatment versions of a film on pressure fields and fluid acceleration. This film's subject was selected for its content difficulty and unfamiliarity to 39 s at a state university. A 2 x 2 factorial design was used for context, retrieval cues, and sequencing variables. The experiment's findings indicated no significance for a two-way interaction. The study, however, suggests that a high degree of film content difficulty and unfamiliarity may weaken the possible positive effect of using advance organizers.

Studies of meaningfulness in learning have investigated verbal and pictorial stimuli separately using various definitions of meaningful learning. Meaningful verbal learning has been associated with the subsumption or hierarchical arrangement of concepts in the learner's memory according to their level of inclusiveness. A theory of meaningful reception learning presupposes that more inclusive concepts subsume less inclusive ones. Thus inclusive concepts and their more general aspects are retained, while specific details of less importance are dismissed. Pictorial learning studies have investigated other factors related to meaningfulness. For instance, meaningfulness has been perceived as the association value in pictorial recognition of abstract and realistic paintings (Koen, 1969), and it has been interpreted as familiarity represented by recognition accuracy of levels of abstraction and realism in word-picture associations (Franzwa, 1973). Although these investigations have focused upon key elements in meaningfulness, no single definition seems adequate to describe meaningful verbal and pictorial learning and retention. One explanation is that descriptions of pictorial meaningfulness are not easily developed. Another reason is that meaningful pictorial concepts and their hierarchical arrangement in memory are difficult to determine. In addition, explanations of the interrelationship of meaninful verbal and pictorial stimuli are made difficult by the variety of concepts present in school learning. Relational concepts necessitate deductive verbal explanations which are not usually needed in the learning of simpler concepts (Carroll, 1964). Moreover,

meaningful verbal and pictorial learning may not occur to the same extent. Studies of verbal and pictorial learning have indicated that the presentation of words and pictures together facilitates the learning of words more than pictorial recognition (Hartman, 1961; Kale & Grosslight, 1955; Paivio and Yarmey, 1966; Jenkins, Neale, & Deno, 1967). The results of these investigations suggest that verbal and pictorial stimuli presented simultaneously in meaningful material, which is to be learned, might facilitate meaningful verbal learning to a greater extent than pictorial learning.

The context in which concepts are presented is important. In a study of meaningful verbal learning and hierarchical levels of context, Gagné and Wiegand (1970) explored the use of organizing statements, finding a significant effect for superordinate context (topic sentence) in the introduction of subsuming material in initial learning. Superordinate context involved more general, abstract, and inclusive information than coordinate context (related sentence). When meaningful material was introduced in advance of subsequent information, superordinate context had a facilitative effect on learning and retention. Organizing effects for superordinate context usually appear in situations where written passages of information are presented in expository style, although advance organizers are not always significant in meaningful learning. In a linear instructional program containing meaningful material, for example, the advance introduction of superordinate context did not significantly affect learning and retention (McMeen, 1974).

The location of organizing statements is important to insure optimal anchorage to relevant existing concepts. Organizers are usually placed before related concepts. It is particularly important for the advance organizer and subsequent meaningful information to be in close proximity when complex concepts to be learned possess many relational attributes.

This assumption may also be extended to placement of a verbal organizer near subsequent meaningful pictorial information.

Retrieval cues are also important. Gagné and Wiegand (1970) investigated the use of such a cue with context. Their retrieval cue consisted of an extra instruction, "This sentence tells what the next few are all about." This statement preceded context information in the superordinate learning condition. They studied its usage as a means of recalling meaningful information which had been learned.

The purpose of the study reported here was to find whether organizers in the form of verbal statements would enhance the retention of complex concepts presented pictorially in a familiar medium of classroom instruction such as an educational film, and whether the sequencing of these organizers in close proximity to related subsuming material and the use of a retrieval cue would facilitate learning and retention.

METHOD

Materials

The material chosen for this study was an educational film titled "Pressure Fields and Fluid Acceleration" which was originally developed for fluid mechanics teachers and engineering students. It was selected for its pictorially meaningful sequences and meaningful verbal content, which was considered to be unfamiliar to the subjects in this study. The film pictorially described experiments in a small water tunnel and demonstrated the relationship between velocity and pressure fields in diffusers, venturis, and channel bends. Nine concepts were taught concerning Bernoulli's integral, pitot tubes, cavitation, and the Coanda effect.

When the material to be learned is unfamiliar because generally related concepts are not present in cognitive structure, the organizer provides

ideational scaffolding for anchorage of new concepts (vis. Ausubel & Fitzgerald, 1961). Thus, the organizer relates new concepts to easily understood ideas in the learner's cognitive structure. Advance organizers used in this film study were stated as follows:

1. The current of a river flows more rapidly away from a bank which reaches into its channel.
2. If equal amounts of a fluid were released along a pipeline and the volume of the fluid entering and leaving the pipeline remained the same, the fluid's pressure would gradually rise as its velocity decreased.
3. In striking a curved surface, water from a hose will slow down where it hits but accelerate as it slides over the curved sides.
4. Stagnation pressure is high and static pressure is low where the channel of a river narrows.
5. Pressure in a tube with a constricted, throatlike passage is lower where the velocity of a fluid is faster.
6. A boat propeller is subject to mechanical stress when the pressure of water flowing along the propeller blade is less than that of the surrounding water.
7. A frisbee trapped between two walls would rise if air were forced against its center, because air would rush to the edges of the frisbee causing it to rise due to a pressure increase.
8. In the bend of a river, water pressure increases toward the outside of the bend.
9. When you place your finger near the side of a jet from a water faucet, the jet bends toward your finger.

These organizing statements were written to facilitate the anchorage of complex relational concepts to simpler ones, that might likely be found in ideational structure. It was assumed that every subject already possessed concepts of what a river current, river bank, and channel were and that advance organizers would provide the necessary scaffolding for assimilating new concepts of velocity and pressure fields shown in the film's small water tunnel experiments.

Subjects

The subjects of this study were 39 university students who were primarily sophomores and juniors in an introductory audiovisual instruction course. These subjects had no knowledge of calculus or physical principles shown in the film. Three subjects were present in each of the treatment groups in Experiments I and II. Thus a total of 24 students completed the experimental treatments and testing sessions. A random method of attrition was used to achieve equal numbers in the treatment groups.

Design

A 2 x 2 factorial design was present in which the variables were context-retrieval cue and sequencing. Four experimental versions of the film were prepared. First, the film was shortened to eliminate mathematical equations. These passages were removed so that they would not interfere with meaningful learning and retention for subjects who had no background in calculus and its use in the derivation of these equations. Secondly, verbal organizers which had been photographed using 16mm film were inserted in the pictorial sequences of the various treatments. The pictorial sequences were the same length in all versions. The superordinate context treatments with a retrieval cue required more time to complete because they took longer to read; each advance organizer was viewed for 15 sec. before subsequent pictorial information was shown. The retrieval cue for these treatments was a short statement, "The sentences in this film are important. Each one tells something about the pictorial information after it." In the sequence treatments, the order of the meaningful concepts in the film was presented either logically according to the way that the film had been originally planned, or illogically by means of randomization. A positive facilitation in the super-

ordinate context treatments, if it occurred, could be interpreted as an organizing effect due to the presence of advance organizers. An analysis of variance was used to study the four treatments in each of the two experiments. Experiment I measured 1-day retention, while Experiment II assessed 2-day retention. The criterion instrument used in both of these experiments consisted of twenty multiple-choice questions testing recognition of the concepts to be learned, which were shown in versions of the film. This instrument was validated using the test-retest method with an interval of one week. A coefficient of reliability of +.73 was obtained using this method.

RESULTS AND DISCUSSION

Analysis of variance results, shown in Tables 1 and 2, yielded no significant effects for the main effects and interactions at the .05 level in either Experiment I or II. The context-retrieval cue was not significant (Exp't. I: F = .03; Exp't. II: F = .69). Neither was logical sequencing significant (Exp't. I: F = .23; Exp't. II: F = 1.43). The two-way interaction, context & retrieval cue - sequencing, was not significant for either experiment. These results suggest that the advance introduction of subsuming material as verbal organizers did not increase the acquisition of meaningful information presented in the film. Retention improved over 2-day retention more than for one day. However, such retention may be considered to be negligible. The fact that retention was minimal in all conditions suggested that the subjects found the material to be learned difficult to assimilate. The advance organizers in the form of superordinate context did not awaken appropriate anchoring concepts in memory.

It is not likely that the presence of verbal organizers in pictorial format will improve the assimilation of complex information in a film. It appears that there is little need to add verbal context statements to films in an attempt to increase the acquisition of meaningful material to be learned. However, the difficulty level of the material presented in the film needs more complete assessment. For less difficult material, the results might be more favorable. However, less difficult material might be more familiar to the subjects. Familiarity is an important factor involved in meaningful learning (Ausubel & Fitzgerald, 1961). The materials chosen for these experiments were unusually difficult for the subjects to learn because they had very little familiarity with the concepts being taught. Consequently, the placement of organizing verbal material in pictorial

sequences did not improve meaningful learning and retention significantly. This fact is also revealed by the results of the sequence condition in which scores did not vary significantly for superordinate context or no-context in either logical or illogical sequencing.

An analysis of the optimum length of hierarchical chains of organizers should be undertaken in future studies. Further research related to meaningful verbal and pictorial learning and retention should explore the influence of advance organizers in pictorial learning, their optimal placement, and the effects of verbal or pictorial correspondence of organizers to the verbal or pictorial format of the subsequent information that is subsumed.

References

Ausubel, D.P., & Fitzgerald, D. The role of discriminability in meaningful verbal learning and retention. Journal of educational psychology, 1961. 52, 266-274.

Carroll, J.B. Words, meanings and concepts. Harvard educational review, 1964, 34, 178-262.

Franzwa, D. Influence of meaningfulness, picture detail, and presentation mode on visual retention. AV communication review, 1973, 21(2), 209-223.

Gagné, R.M., & Wiegand, V.K. Effects of a superordinate context on learning and retention of facts. Journal of educational psychology, 1970, 61, 406-409.

Hartman, F.R. Recognition learning under multiple channel presentation and testing conditions. AV communication review, 1961, 9(1), 24-43.

Jenkins, J.R., Neale, D.C., & Deno, S.L. Differential memory for picture and word stimuli. Journal of educational psychology, 1967, 58, 303-307.

Kale, S.V., & Grosslight, J.H. Exploratory studies in the use of pictures and sound for teaching foreign language vocabulary. (Technical report SDC 269-7-53), U.S. Naval Special Devices Center, Port Washington, N.Y.: 1955.

Koen, F. Verbal and non-verbal mediators in recognition memory for complex visual stimuli. Center for Research on Language and Learning Behavior, University of Michigan, 1969. (ERIC ref. no., ED 029 349).

McMeen, G.R. Effects of context and size of step on meaningful learning and retention in a linear instructional program. Unpublished doctoral dissertation, University of Southern California, 1974. (ERIC ref. no., ED 095 826).

Paivio, A., & Yarmey, A.D. Pictures versus words as stimuli and responses in paired-associate learning. Psychonomic science, 1966, 5, 235-236.

Table I

Analysis of Variance on Retention Scores, Experiment I.

Source	df	MS	F
Context-retrieval (A)	1	0.34	0.03
Sequence (B)	1	3.00	0.23
A X B	1	1.33	0.10
Within		52.00	

*$p < .05$.

Table 2

Analysis of Variance on Retention Scores, Experiment II.

Source	df	MS	F
Context-retrieval (A)	1	6.75	0.69
Sequence (B)	1	14.09	1.43
A X B	1	0.07	0.01
Within	4	39.34	

*$p < .05$.